README Document for Carbon Monitoring System (CMS) Methane (CH4) Flux for North America Daily Product

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Revision History

Revision Date	Changes	Author
9/8/2016	Original Document	Thomas Hearty
2/26/2018	Updated the Document to describe the Daily product	Thomas Hearty

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1.0 Introduction

This document provides basic information for using Version 1 of the Carbon Monitoring System (CMS) Methane (CH4) Flux for North America Daily data derived from Greenhouse Gases Observing SATellite (GOSAT) observations. More details about the observations and algorithm are described in Turner et al. 2015.

1.1 Dataset/Mission Instrument Description

The NASA Carbon Monitoring System (CMS) is designed to make significant contributions in characterizing, quantifying, understanding, and predicting the evolution of global carbon sources and sinks through improved monitoring of carbon stocks and fluxes. The System will use the full range of NASA satellite observations and modeling/analysis capabilities to establish the accuracy, quantitative uncertainties, and utility of products for supporting national and international policy, regulatory, and management activities. CMS will maintain a global emphasis while providing finer scale regional information, utilizing space-based and surface-based data and will rapidly initiate generation and distribution of products both for user evaluation and to inform near-term policy development and planning.

1.3 Data Disclaimer

The data should not be used in publications without first contacting the investigators. The Carbon Monitoring System (CMS) Methane (CH4) Flux for North America data may be acknowledged using the following DOI:

10.5067/RF3R3G9I3UVX

2.0 Data Organization

The Carbon Monitoring System (CMS) CH4 Flux for North America data are averaged on a 0.5 degree latitude x 0.667 degree longitude grid. The CH4 emission values are reported once per day for each grid cell for 12 different emission sectors.

2.1 File Naming Convention

The file names of the Carbon Monitoring System (CMS) CH4 Flux for North America (CMS_CH4_FLX_NA) product are defined as follows:

CH4_flux_YYYYMMDD.nc

Where:

- YYYY = 4 digit year

- MM = 2 digit month of they year

- DD = 2 digit day of the month

2.2 File Format and Structure

The files are stored in NetCDF-3 format.

3.0 Data Contents

Sptial Grid: The emission is reported as a 3D variable. The first dimension is for the 9 different emission sectors given below and the 2nd and 3rd dimensions are latitude and longitude, respectively. The sectors are ordered as follows:

1. Total
2. OilGas
3. Coal
4. Cows
5. Waste (Landfills+wastewater)
6. Biofuel
7. Rice
8. OtherAnthro
9. BiomassBurning
10. Wetlands
11. SoilAbsorp
12. OtherNatural

Dimension of other variables: lat = 121, lon = 151

The units and longname and fill values are given in variable attributes called "units", "long_name", and "_FillValue".

Data Fields:

Data Field Name	Description
emissions	CH4 emissions in kg/day
emissions_nmol	CH4 Flux in nmol/(m2 s)
Lat	Latitude in degrees
Lon	Longitude in degrees

4.0 Options for Reading the Data

4.1 Programming Languages

The data can be read using major programming languages such as Fortran, C, Java, IDL, Matlab, and Python.

4.2 Command Line Utility

ncdump
The ncdump tool can be used as a simple browser for HDF data files, to display the dimension names and sizes; variable names, types, and shapes; attribute names and values; and optionally, the values of data for all variables or selected variables in a netCDF file. The most common use of ncdump is with the –h option, in which only the header information is displayed.

ncdump [-c|-h] [-v ...] [[-b|-f] [c|f]] [-l len] [-n name] [-d n[,n]] filename
Options/Arguments:
[-c] Coordinate variable data and header information
[-h] Header information only, no data
[-v var1[,...]] Data for variable(s) <var1>,... only data
[-f [c|f]] Full annotations for C or Fortran indices in data
[-l len] Line length maximum in data section (default 80)
[-n name] Name for netCDF (default derived from file name)
[-d n[,n]] Approximate floating-point values with less precision filename File name of input netCDF file

4.3 A tool for simple visualization

Panoply, developed at the Goddard Institute for Space Studies (GISS), is compliant with NetCDF Climate and Forecast (CF) Metadata Convention that is gaining popularity. A strength of the tool is that data can be previewed "remotely" over the network – i.e. user can preview file content of HDF files stored on a remote site, without downloading them. Panoply is available from GISS:

http://www.giss.nasa.gov/tools/panoply/

5.0 Data Services

Data services and access methods can be found on the dataset landing page for the methane product:

http://disc.sci.gsfc.nasa.gov/datacollection/CMS_CH4_FLX_NA_ 1.html.

If you need assistance or wish to report a problem:
Email: gsfc-help-disc@lists.nasa.gov
Voice: 301-614-5224
Fax: 301-614-5268
Address:
Goddard Earth Sciences Data and Information Services Center NASA Goddard Space Flight Center Code 610.2 Greenbelt, MD 20771 USA

7.0 Acknowledgments

References

Turner, A. J., Jacob, D. J., Wecht, K. J., et al. (2015). Estimating global and North American methane emissions with high spatial resolution using GOSAT satellite data. *Atmospheric Chemistry & Physics*, 15, 7049.